Additional materials:
   A2 Drawing paper (4 sheets)
   Standard Drawing Equipment

TIME   3 hours

INSTRUCTIONS TO CANDIDATES

Print your name, Centre number and candidate number at the bottom right-hand corner of every sheet of paper you use.

Answer **all** questions from Section I and any **three** questions from Section II.

Write or draw your answers on the separate drawing paper provided.

Work **all** your answers in SI units. Use both sides of the drawing paper.

All solutions are to be drawn full-size unless a contrary instruction is given. Construction lines must be shown clearly.

If you use more than one sheet of paper, fasten the sheets together.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

The diagrams are not necessarily drawn to scale.

All dimensions are in millimetres unless otherwise stated.

You are reminded of the need for clear presentation in your answers.

This question paper consists of 10 printed pages and 2 blank pages.

UNIVERSITY *of* CAMBRIDGE
Local Examinations Syndicate

[Turn over

Section I (40 marks)

Answer **all** questions in this section.

1   A sketch of an 'up and over' garage door is shown with the door partially open in Fig. 1a. The line drawing, Fig. 1b, shows the garage door in the fully closed position.

As the door opens, the top of the door **a**, moves from **A** to **A₁**, while the bottom of the door **b**, swings upwards from **B** to **B₁**. The stay **CD** pivots on the garage wall at **C** and the edge of the door at **D**.

(a) Draw Fig. 1b to a scale of 1:20.   [3]

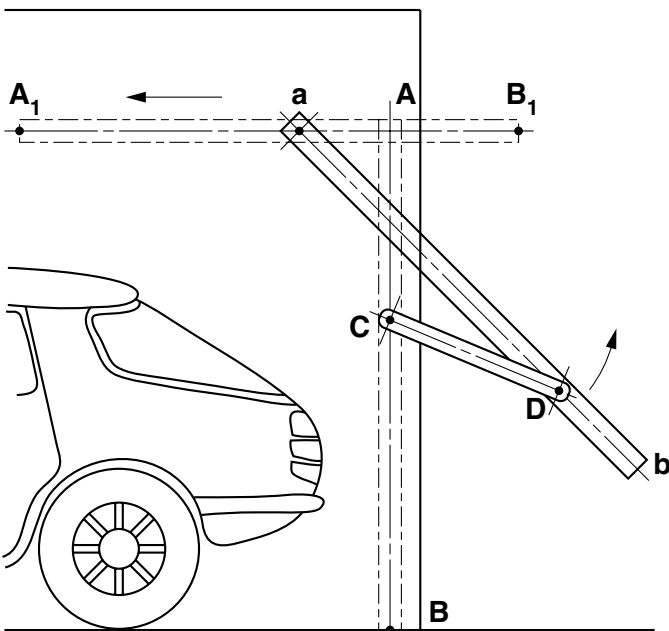**(b)** Construct the locus of the bottom of the door as it opens from **B** to **B₁**.   [5]
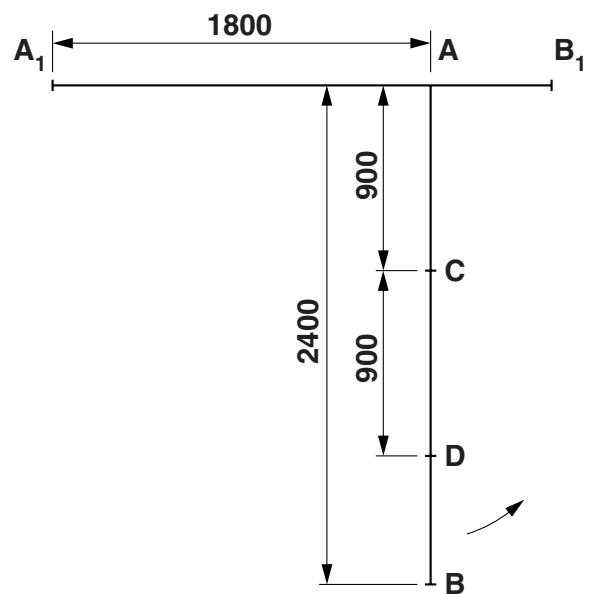
Fig. 1a   **Fig. 1b**

2 Orthographic views of an open-topped elliptical box are given in Fig. 2.

   (a) Draw the given views full size.   [3]

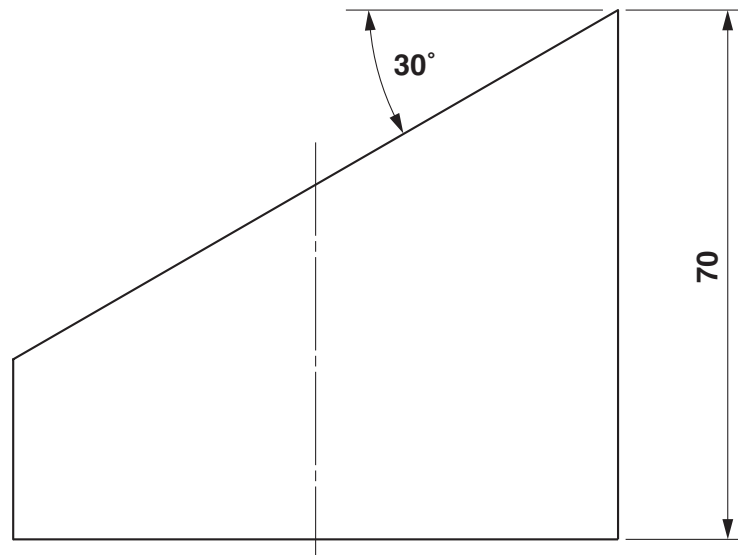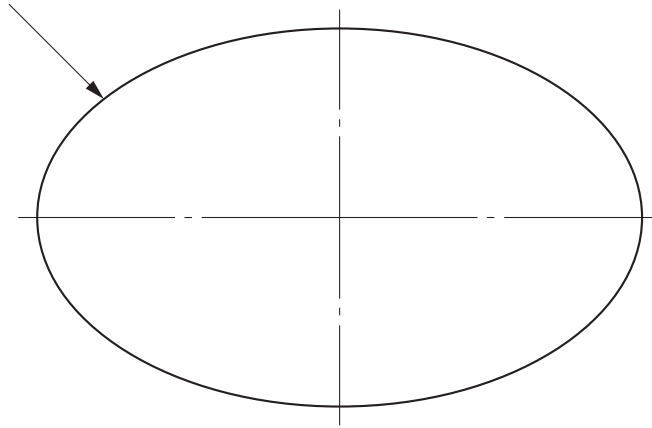   **(b)** Construct the development of the curved side of the box.   [5]

<u>**ELLIPSE**</u>

MAJOR AXIS   80
MINOR AXIS   50

30˚

70

Fig. 2

[Turn over

3 A children's paddling pool and shelter are built on an irregularly shaped site. The sketch, Fig. 3a, gives an impression of the site and a dimensioned plan view of it is given in Fig. 3b.

Construct a scale 1:200 plan view of the site, pool and shelter. [12]
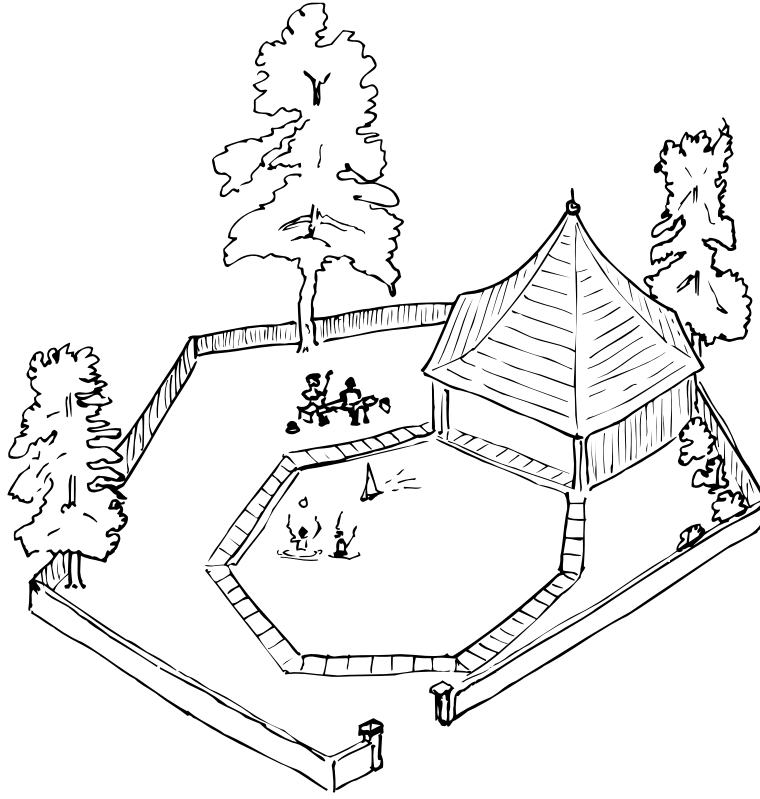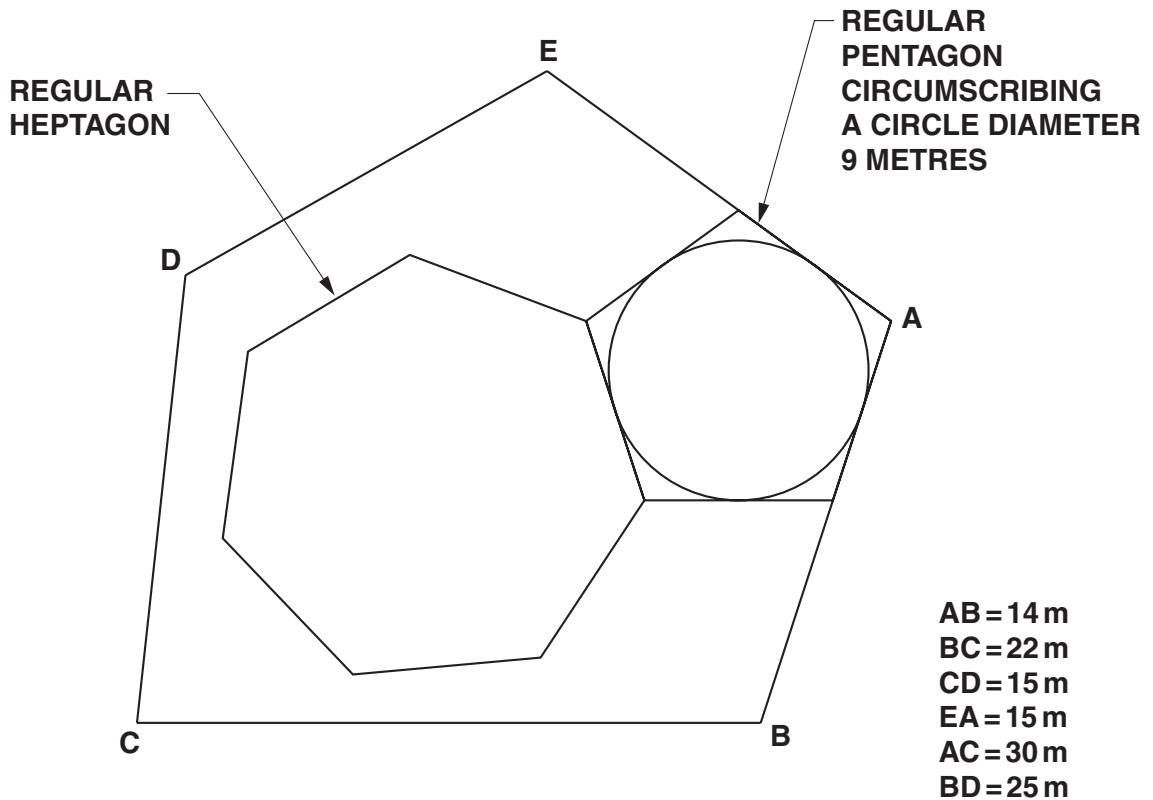

Fig. 3a

REGULAR PENTAGON CIRCUMSCRIBING A CIRCLE DIAMETER 9 METRES

REGULAR HEPTAGON

AB = 14 m
BC = 22 m
CD = 15 m
EA = 15 m
AC = 30 m
BD = 25 m

Fig. 3b

4 A view of a flanged elbow pipe is given in Fig. 4.

(a) Draw the given view full size. [3]

(b) Project, in third angle orthographic projection, the sectional view **SS**. Hidden detail is not required. [9]
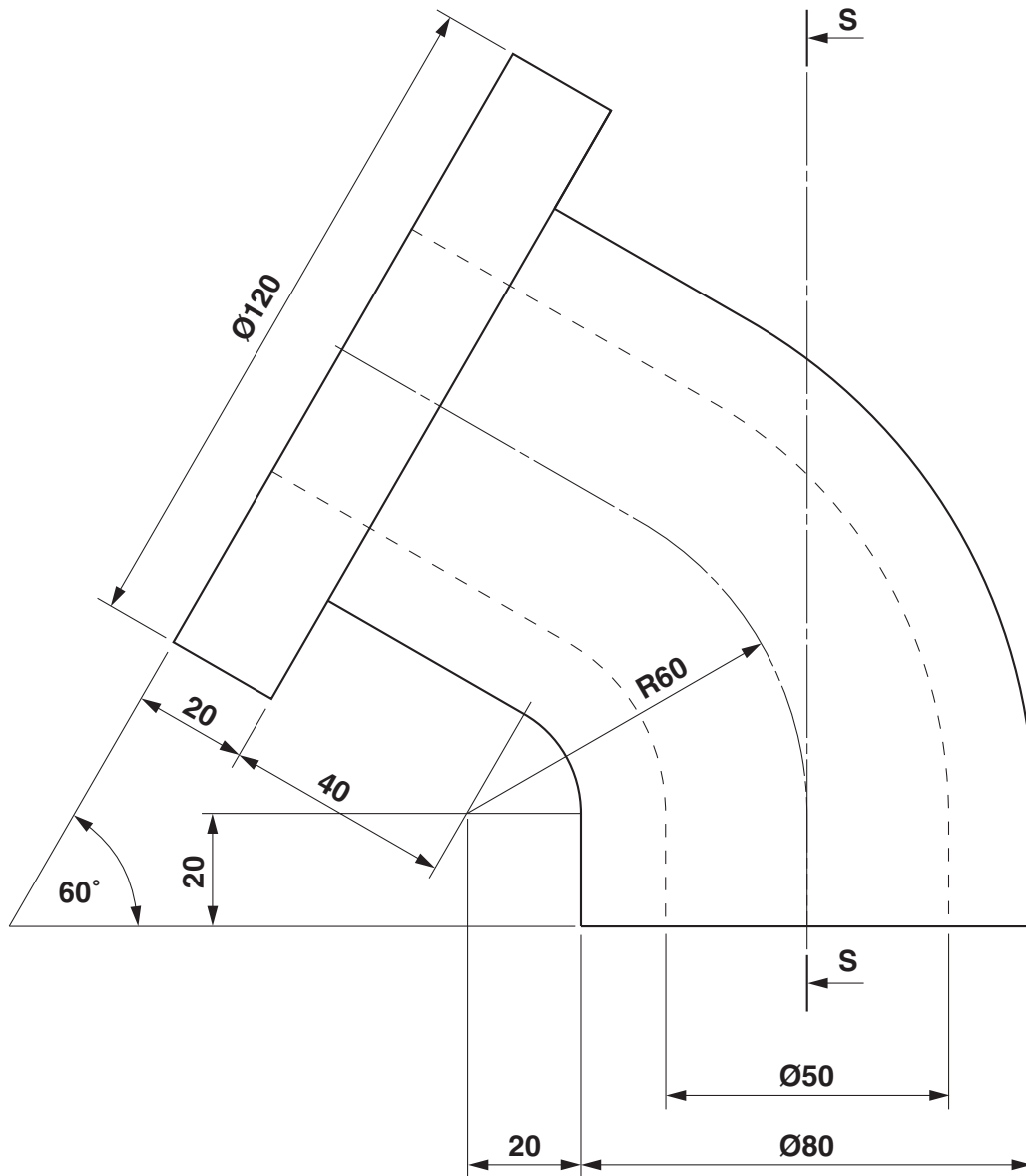

Fig. 4

[Turn over

Section II (60 marks)

Attempt no more than **three** questions from this section.

All questions carry equal marks.

5   Orthographic views of the case of a clock are given in Fig. 5.

Construct an **isometric** view of the clock case with the corner **C** to the front of your drawing.

The isometric scale **must** be used.

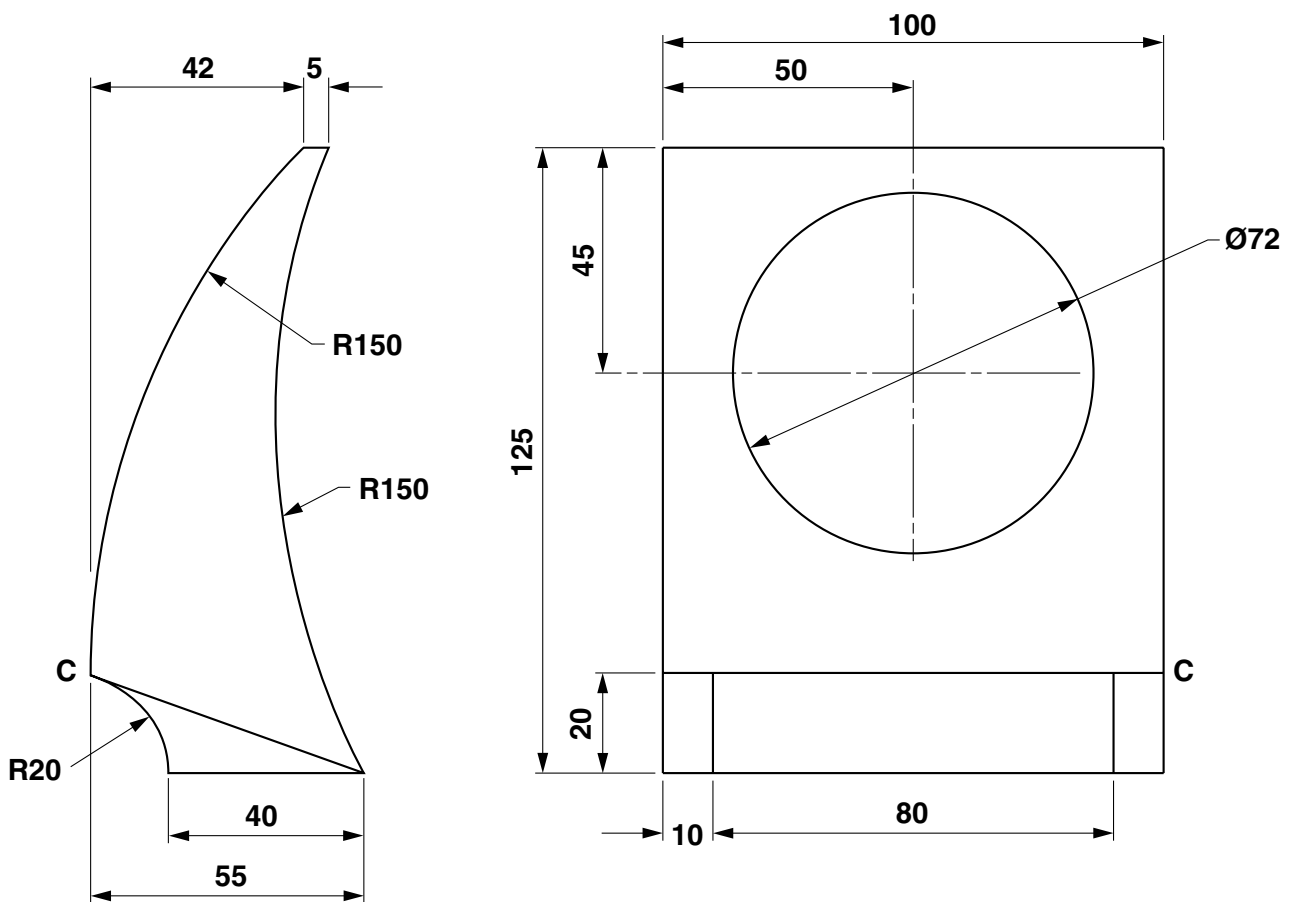All construction lines **must** be seen clearly.   [20]

Fig. 5

6 Fig. 6 shows a section of a dam.

    (a) Draw the given section to a scale of 1:500. Do **not** draw the section shading.   [5]

    (b) Using a graphical integration method, determine the area of the section of the dam.   [15]
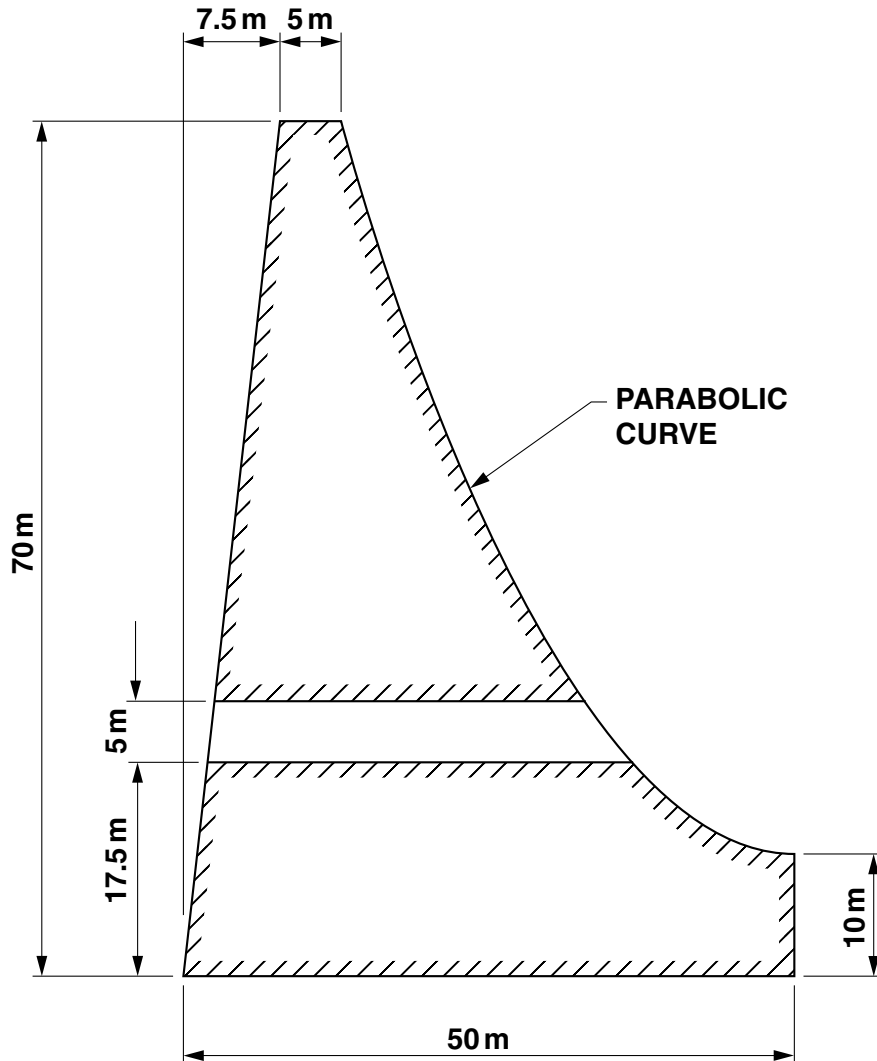

Fig. 6

    [Turn over

7 A pictorial view of a dovetailed guide is shown in Fig. 7. A scrap view showing the true size and shape of the dovetailed slot is also given.

(a) Draw, full size, the orthographic view of the dovetailed guide looking in the direction of the arrow **SV**. [1]

(b) Project a first auxiliary view of the dovetailed guide selected to show the true shape of surface **A**. [9]

(c) Project a second auxiliary view showing the true angles of the dovetailed slot. [10]

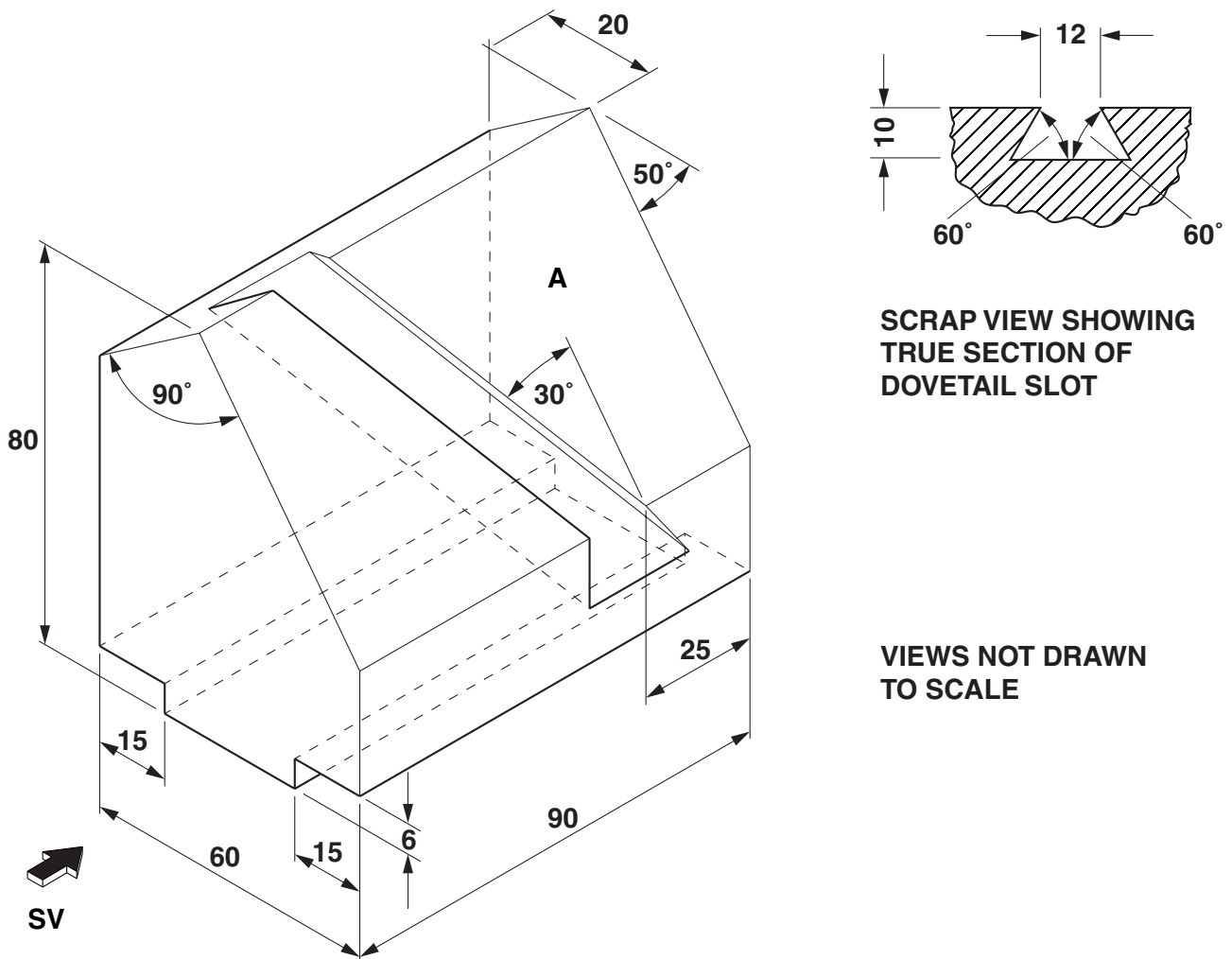Hidden detail is required in all three views.

SCRAP VIEW SHOWING TRUE SECTION OF DOVETAIL SLOT

VIEWS NOT DRAWN TO SCALE

Fig. 7

8   Fig. 8 shows a beam simply supported as shown. There are two uniformly distributed loads and one concentrated load as indicated.

   (a) Draw the given diagram to a scale of 1:100.   [1]

   (b) Determine graphically the magnitude of the reactions **R**_L and **R**_R. Use a polar distance of 50 mm.   [6]

   (c) Construct a shear force diagram for the beam. Use a scale of 10 mm = 10 kN. Indicate positions of zero shear force.   [6]

   (d) Construct the bending moment diagram for the beam on a horizontal base. Give the magnitude and position of the maximum bending moment.   [7]

   Your answers to **(b)**, **(c)** and **(d)** must be shown clearly on or adjacent to your drawing.
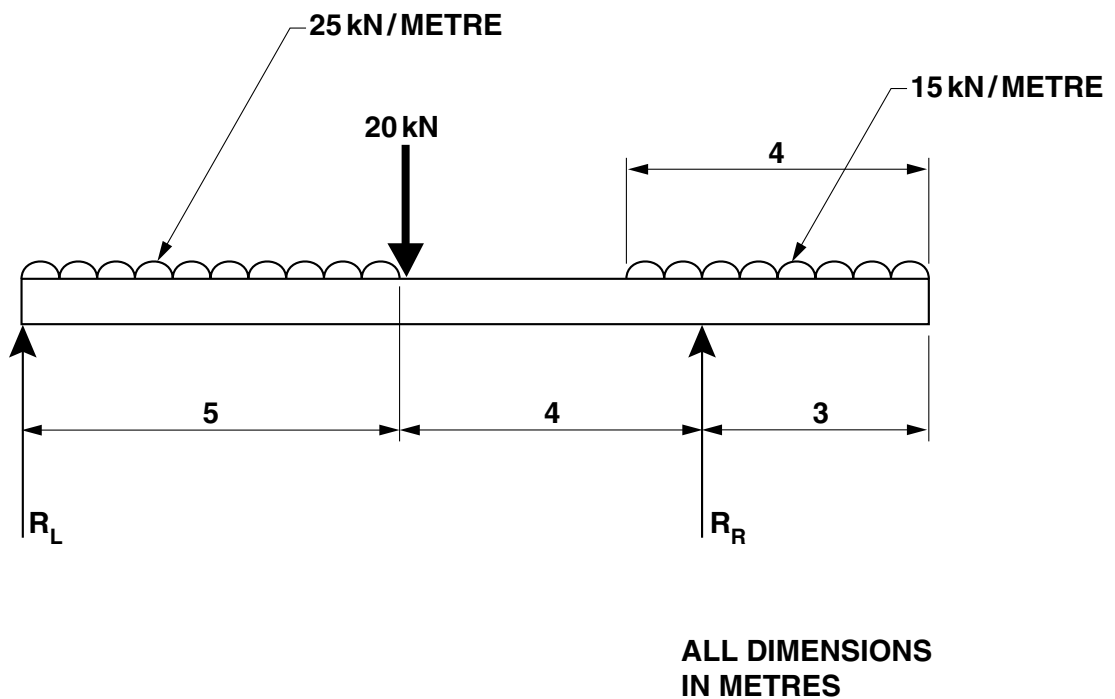

Fig. 8

ALL DIMENSIONS
IN METRES

[Turn over

9 Part of the lens carrier of a film projector consists of a metal tube 62 mm long, with an outside diameter 50 mm and an inside diameter 32 mm.

In order to adjust the lens, there is a stopped helical groove centrally positioned on the outside of the tube. The groove, which has semicircular ends, is rectangular in section, 6 mm wide, 3 mm deep, has a pitch of 36 mm and makes one complete right-hand turn of the tube.

Draw, twice full size, a longitudinal view of the tube showing the groove starting and stopping on the horizontal centre line.

Hidden detail is required. [20]

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